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On the Orbit of 42 Comæ Berenicis = Σ 1728.
By T. J. J. See, A.M., Ph.D. (Berlin.)

In the course of a general revision of the orbits of double stars I had occasion some three years ago to examine the theory of 42 *Comæ Berenicis*. Professor Burnham generously placed at my disposal a list of measures which was nearly complete, and I have since added to it such as were omitted, and made also new observations during 1895. When scrutinised under the fine definition of the 26-inch Clark refractor of the Leander McCormick Observatory of the University of Virginia, the pair proved to be excessively close, and with a power of 1,300 could only be elongated. As the object has now become single in all existing telescopes, and cannot again be separated until about 1899, I take this opportunity to present to the Society an investigation of the orbit of this peculiarly interesting star. The only previous investigation of the orbit is that made by Otto Struve and Dubiago in 1874 (*Monthly Notices*, 1874-75, p. 367). Struve's elements are as follows :—

$P = 25.71$ years.	$\Omega = 11^{\circ}0$
$T = 1869.92$	$i = 90^{\circ}$
$e = 0.480$	$\lambda = 99^{\circ}18$
$a = 0''.657$	

The method followed here is not very different from that employed by Struve, except that the results are based on the measures of all reliable observers and are rendered more complete by observations made since 1874—indeed, up to the occultation of 1896.

It will be seen from an examination of the table at the end of the paper that the motion is to all appearances exactly in the line of vision, and hence, with the exception of the node and inclination, the elements are based wholly on the measures of distance. Struve's elements are fairly good, and it would, therefore, be sufficient to apply differential corrections to his values; but as I had independently adopted a graphical method similar to that employed by him, it seemed of interest to make use of it in deriving approximate values directly from the phenomena.

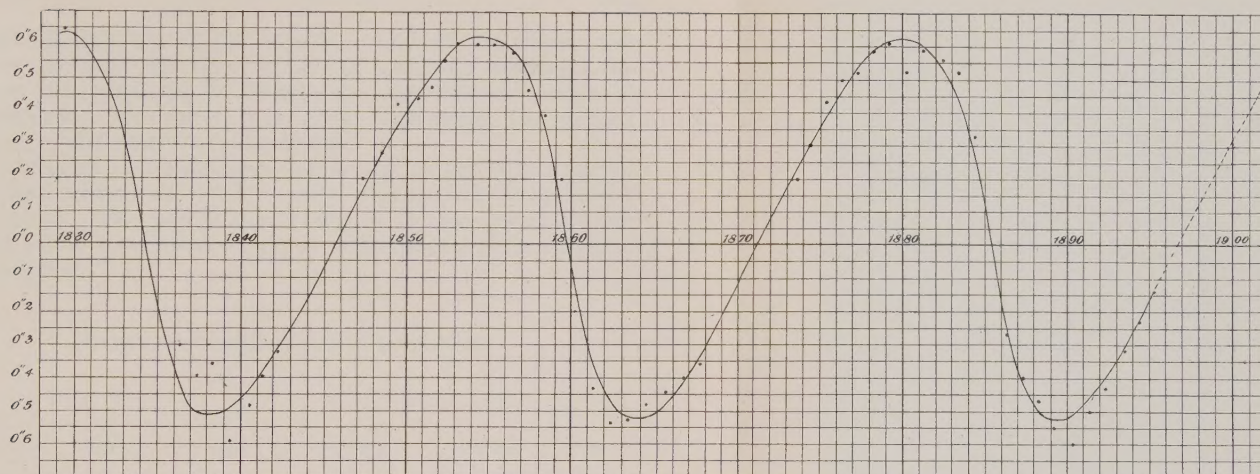
When the elements had been approximately determined the observations furnished 52 equations of condition for determining five unknowns; weights were assigned in proportion to the number of nights, and when the least square solutions had been effected the corrected elements came out as follows:—

$P = 25.556$ years.	$\Omega = 11^{\circ}9$
$T = 1885.69$	$i = 90^{\circ}$
$e = 0.461$	$\lambda = 280^{\circ}5$
$a = 0''.6416$	$n = \pm 14^{\circ}09$

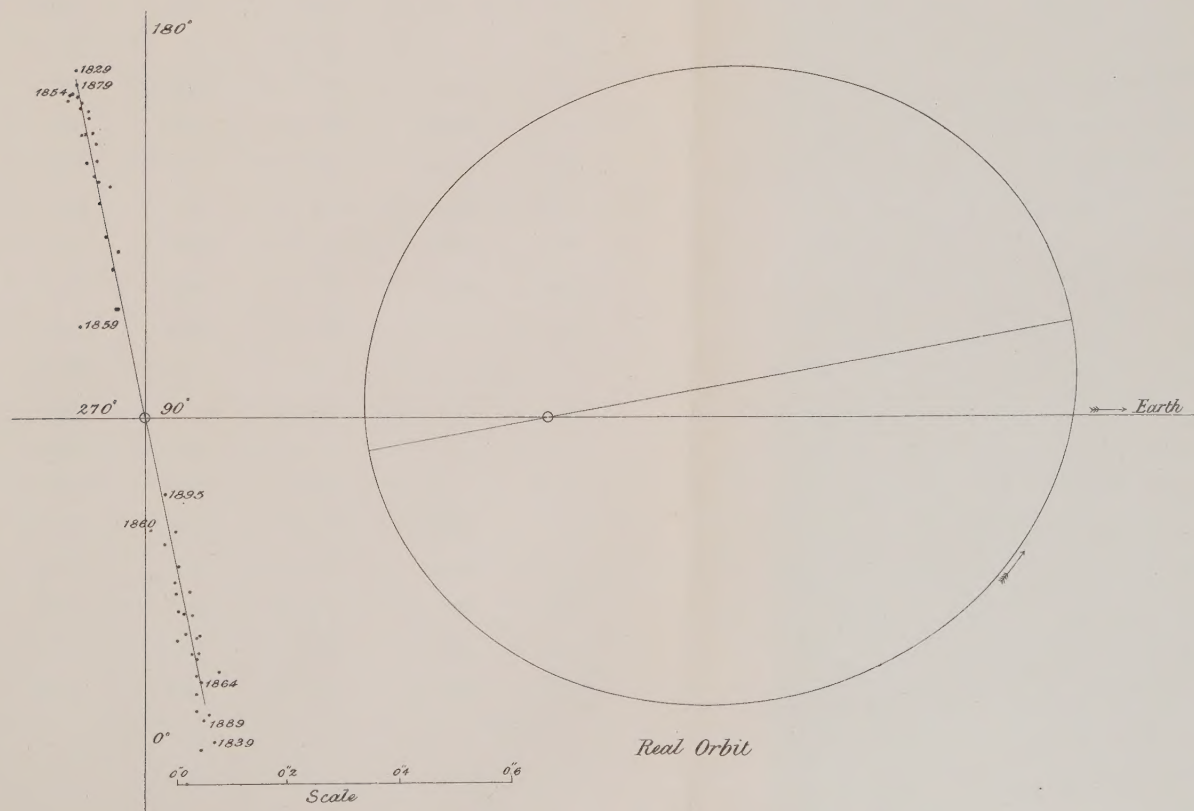
Apparent orbit :

Distance of star from centre	$= 0''.054$
Length of major axis	$= 1''.147$
Length of minor axis	$= 0.00$
Angle of major axis	$= 11^{\circ}9$
Angle of <i>Periastron</i>	$= 11^{\circ}9$

The apparent phenomena are shown in the accompanying diagram, to which is added a figure of the real orbit. A



Graphical Illustration of the Motion of 42 Comae Berenices = Σ 1728.



42 Comae Berenices = Σ 1728.

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graphical illustration of the motion, obtained by taking the x axis to represent the time, while the ordinates represent the distances, was employed in finding the approximate values of the elements; the curve here given represents the motion according to the elements as corrected.

This orbit of 42 *Comæ Bereniciæ* is one of the most exact of double-star orbits, and will finally require but very slight improvement. The period can hardly be in error by more than 0.1 year, while a variation of ± 0.01 in the eccentricity is not to be anticipated.

Comparison of Computed with Observed Places.

	θ_0	ρ_0	$\theta_0 - \theta_c$	$\rho_0 - \rho_c$	n
1827.83	189.5	obl.	- 2.4	+ 0.01	2-1
1829.40	191.6	0.64	- 0.3	...	3
1833.37	70.7?	obl.	- 21.2	...	1
1834.43	228.3	obl.	+ 36.4	...	1
1835.39	11.2	...	- 0.7	...	4
1836.41	10.2	0.30	- 1.7	- 0.12	3
1837.40	11.0	0.39	- 0.9	- 0.11	6
1838.41	11.5	0.36	- 0.4	- 0.15	3
1839.42	12.2	0.59	+ 0.3	+ 0.09	...
1840.60	17.1	0.48	+ 5.2	+ 0.04	6
1841.40	14.6	0.40	+ 2.7	+ 0.02	14-7
1842.43	14.7	0.32	+ 2.8	+ 0.02	7-3
1843.36	single	...	...	...	2
1844.32	189.5	...	- 2.4	...	2
1845.47	single	...	...	...	...
1846.40	66.8?	obl.?	+ 54.9	...	3
1847.42	195.5	0.20	+ 3.6	+ 0.02	1
1848.42	192.7	0.27	+ 0.8	0.00	3
1849.42	188.6	0.42	- 3.3	+ 0.06	3
1850.69	192.3	0.44	+ 0.4	- 0.01	4
1851.55	190.9	0.47	- 1.0	- 0.04	8-6

	θ_0	ρ_0	$\theta_0 - \theta_c$	$\rho_0 - \rho_c$	n
	$^{\circ}$		$^{\circ}$	"	
1852.42	191.0	0.55	- 0.9	- 0.01	9-8
1853.28	193.0	0.60	+ 1.1	$\pm$ 0.00	21-16
1854.39	193.5	0.60	+ 1.6	- 0.02	14-13
1855.41	193.9	0.59	+ 2.0	- 0.02	4-3
1856.59	192.4	0.57	+ 0.5	0.00	14-13
1857.44	193.0	0.47	+ 1.1	- 0.04	5-3
1858.42	192.4	0.39	+ 0.5	+ 0.04	8
1859.36	215.8	0.2 $\pm$	+ 23.9	+ 0.06	3
1860.34	3.5?	0.2 $\pm$	- 8.4	+ 0.08	1
1861.40	13.1	0.43	+ 1.2	+ 0.09	4-2
1862.34	12.4	0.54	+ 0.5	+ 0.08	11-2
1863.35	10.2	0.53	- 1.7	+ 0.01	2
1864.42	12.3	0.48	+ 0.4	- 0.03	6-4
1865.56	12.4	0.44	+ 0.5	- 0.03	13-8
1866.64	8.5	0.40	- 3.4	- 0.01	3
1867.62	13.9	0.36	+ 2.0	+ 0.03	4-2
1868.44	15.8	0.21	+ 3.9	- 0.04	2
1869.37	15.2	0.61?	...	...	5
1870.45	16.0	0.61	...	...	4
1871.41	194.6	0.61	...	...	3-0
1872.47	200.0	0.61	...	...	3
1873.60	194.7	0.20	+ 2.8	- 0.03	5-2
1874.41	189.2	0.30	- 2.7	0.00	2
1875.42	191.3	0.43	- 0.6	+ 0.03	26-25
1876.40	190.4	0.50	- 1.5	+ 0.03	16
1877.43	190.9	0.52	- 1.0	- 0.01	17-13
1878.40	191.4	0.58	- 0.5	0.00	11-8
1879.40	191.9	0.61	0.0	0.00	12
1880.38	193.0	0.52	+ 1.1	- 0.10	8
1881.34	192.3	0.59	- 0.4	- 0.02	26-18
1882.52	190.9	0.56	- 1.0	+ 0.02	22-18

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t	θ_0	ρ_0	$\theta_0 - \theta_c$	$\rho_0 - \rho_c$	n
	⁰		⁰	"	
1883'46	192'3	0'52	+ 0'4	+ 0'09	19-18
1884'40	192'7	0'33	+ 0'8	+ 0'07	7
1886'46	12'9	0'27	+ 1'0	+ 0'02	9
1887'43	13'3	0'40	+ 1'4	- 0'01	13
1888'33	11'5	0'47	- 0'4	- 0'02	7-6
1889'25	11'1	0'55	- 0'8	+ 0'03	7
1890'38	9'9	0'60	- 2'0	+ 0'09	16
1891'44	11'0	0'50	- 0'9	+ 0'05	12
1892'40	11'4	0'43	- 0'5	+ 0'04	16-13
1893'45	10'2	0'32	- 1'7	+ 0'01	5
1894'41	9'0	0'23	- 2'9	+ 0'01	8
1895'29	13'9	0'14	+ 2'0	0'00	3

The University of Chicago :
1896 March 30.

Ephemeris for Physical Observations

Greenwich Noon.	P.	L-O.	B.	Apparent Diameter.			d.	w.	B'.
				Equat. 2a	Defect. 2a	Polar. 2b			
1896.									
Oct. 7	23°121	16°323	-0°650	33°09	0°13	31°02	7°29	268°66	-0°69
9	23°187	16°691	0°669	33°21	°14	31°13	7°50	268°61	0°71
11	23°252	17°054	0°688	33°34	°15	31°25	7°71	268°56	0°73
13	23°315	17°412	0°707	33°47	°16	31°37	7°41	268°52	0°75
15	23°376	17°765	0°726	33°60	°17	31°49	8°11	268°48	0°77
17	23°435	18°112	-0°745	33°74	0°18	31°62	8°30	268°44	-0°79
19	23°493	18°452	0°764	33°88	°19	31°75	8°48	268°40	0°81
21	23°548	18°786	0°783	34°03	°19	31°89	8°66	268°36	0°83
23	23°602	19°114	0°801	34°18	°20	32°03	8°83	268°33	0°85
25	23°654	19°435	0°820	34°33	°21	32°18	9°00	268°29	0°87
27	23°704	19°749	-0°838	34°49	0°22	32°33	9°16	268°26	-0°89
29	23°753	20°056	0°856	34°65	°23	32°48	9°31	268°23	0°91
31	23°799	20°356	0°874	34°82	°24	32°64	9°45	268°20	0°93
Nov. 2	23°843	20°648	0°892	34°99	°24	32°80	9°59	268°16	0°95
4	23°886	20°932	0°909	35°17	°25	32°97	9°72	268°13	0°97
6	23°927	21°208	-0°926	35°35	0°26	33°14	9°84	268°10	-0°99
8	23°967	21°475	0°943	35°54	°27	33°31	9°95	268°07	1°01
10	24°005	21°733	0°960	35°73	°27	33°49	10°05	268°04	1°02
12	24°041	21°983	0°977	35°92	°28	33°67	10°15	268°01	1°04
14	24°075	22°224	0°994	36°12	°29	33°85	10°24	267°98	1°06
16	24°107	22°455	-1°010	36°32	0°29	34°04	10°31	267°94	-1°08
18	24°138	22°676	1°026	36°52	°30	34°23	10°38	267°91	1°10
20	24°167	22°887	1°042	36°73	°30	34°43	10°43	267°88	1°11
22	24°195	23°089	1°058	36°94	°31	34°63	10°48	267°85	1°13
24	24°221	23°281	1°073	37°16	°31	34°83	10°52	267°82	1°14
26	24°245	23°461	-1°088	37°38	0°32	35°04	10°54	267°79	-1°16
28	24°268	23°631	1°103	37°60	°32	35°25	10°56	267°76	1°18
30	24°289	23°790	1°117	37°83	°32	35°46	10°56	267°72	1°19
Dec. 2	24°308	23°937	1°131	38°06	°32	35°67	10°55	267°68	1°21
4	24°326	24°073	1°145	38°29	°32	35°88	10°53	267°64	1°22
6	24°342	24°198	-1°158	38°52	0°32	36°10	10°50	267°61	-1°24
8	24°356	24°310	1°171	38°75	°32	36°32	10°46	267°57	1°25
10	24°369	24°410	1°184	38°99	°32	36°55	10°41	267°54	1°26

of Jupiter, 1896-97. By A. Marth.

Greenwich Noon.	Bright- ness in Star Magn.	Longitude of $\mathcal{L}$'s Central Meridian.		Corr. for Phase.	Light- time.	$\Delta - 0.$	$B.$
1896. Oct.	m	I. °	II. °	°	m	°	°
7	-1°37	121°99	147°66	+0°23	50°331	9°0402	-0°4855
9	-1°38	77°54	87°94	'24	50°149	9°1961	'4938
11	-1°38	33°09	28°23	'26	49°962	9°3520	'5021
13	-1°39	348°65	328°53	'27	49°770	9°5078	'5103
15	-1°40	304°21	268°84	'29	49°573	9°6636	'5185
17	-1°41	259°79	209°15	+0°30	49°371	9°8193	-0°5267
19	-1°42	215°38	149°48	'31	49°164	9°9750	'5349
21	-1°43	170°97	89°81	'33	48°953	10°1307	'5431
23	-1°44	126°57	30°15	'34	48°737	10°2863	'5513
25	-1°45	82°19	330°50	'35	48°517	10°4419	'5595
27	-1°45	37°81	270°86	+0°36	48°293	10°5975	-0°5677
29	-1°46	353°44	211°24	'38	48°064	10°7530	'5759
31	-1°47	309°08	151°62	'39	47°832	10°9085	'5841
Nov.							
2	-1°49	264°73	92°01	'40	47°596	11°0640	'5923
4	-1°50	220°40	32°41	'41	47°357	11°2195	'6005
6	-1°51	176°07	332°82	+0°42	47°114	11°3749	-0°6086
8	-1°52	131°75	273°24	'43	46°869	11°5303	'6168
10	-1°53	87°44	213°67	'44	46°620	11°6857	'6250
12	-1°54	43°15	154°11	'45	46°369	11°8410	'6331
14	-1°55	358°86	94°57	'46	46°116	11°9963	'6412
16	-1°56	314°59	35°03	+0°46	45°860	12°1515	-0°6493
18	-1°57	270°33	335°50	'47	45°603	12°3067	'6575
20	-1°59	226°07	275°99	'47	45°344	12°4619	'6656
22	-1°60	181°83	216°49	'48	45°084	12°6171	'6737
24	-1°61	137°59	156°99	'48	44°822	12°7723	'6818
26	-1°62	93°37	97°51	+0°48	44°559	12°9274	0°6899
28	-1°64	49°16	38°04	'48	44°296	13°0825	'6980
30	-1°65	4°96	338°58	'48	44°032	13°2375	'7061
Dec.							
2	-1°66	320°78	279°13	'48	43°768	13°3925	'7142
4	-1°68	276°61	219°69	'48	43°505	13°5475	'7223
6	-1°69	232°44	160°27	+0°48	43°242	13°7025	-0°7303
8	-1°70	188°29	100°85	'48	42°979	13°8574	'7384
10	-1°71	144°15	41°45	'47	42°718	14°0123	'7465

Greenwich Noon.	P.	L-O.	B.	Apparent Diameter.			d.	w.	B'.
				Equat. 2a	Defect. "	Polar. 2b			
1896.									
Dec. 12	24°38'1	24°49'8	1°19'6	39°23	'32	36°77	10°35	267°50	1°28
14	24°39'1	24°57'4	1°20'8	39°47	'32	36°99	10°27	267°45	1°29
16	24°39'9	24°63'7	-1°21'9	39°71	0°31	37°22	10°17	267°40	-1°30
18	24°40'6	24°68'8	1°23'0	39°95	'31	37°45	10°07	267°36	1°31
20	24°41'1	24°72'6	1°24'1	40°20	'30	37°67	9°95	267°31	1°32
22	24°41'5	24°75'1	1°25'1	40°44	'30	37°90	9°82	267°26	1°33
24	24°41'7	24°76'3	1°26'1	40°68	'29	38°13	9°68	267°21	1°34
26	24°41'8	24°76'3	-1°27'0	40°92	0°28	38°35	9°53	267°15	-1°35
28	24°41'7	24°75'0	1°27'9	41°16	'27	38°58	9°36	267°09	1°36
30	24°41'4	24°72'3	1°28'7	41°40	'26	38°80	9°18	267°03	1°37
1897.									
Jan. 1	24°41'0	24°68'3	1°29'4	41°64	'25	39°02	8°98	266°97	1°38
3	24°40'4	24°63'1	1°30'1	41°87	'24	39°24	8°78	266°90	1°39
5	24°39'6	24°56'5	-1°30'8	42°10	0°23	39°46	8°56	266°82	-1°40
7	24°38'7	24°48'7	1°31'4	42°33	'22	39°67	8°32	266°74	1°40
9	24°37'7	24°39'6	1°31'9	42°35	'21	39°88	8°08	266°66	1°41
11	24°36'5	24°29'3	1°32'4	42°77	'20	40°08	7°82	266°57	1°41
13	24°35'1	24°17'8	1°32'8	42°98	'19	40°28	7°55	266°47	1°42
15	24°33'5	24°05'1	-1°33'2	43°19	0°17	40°48	7°27	266°36	-1°42
17	24°31'8	23°9'13	1°33'5	43°39	'16	40°67	6°98	266°25	1°42
19	24°30'0	23°7'63	1°33'7	43°58	'15	40°85	6°67	266°12	1°43
21	24°28'0	23°6'02	1°33'9	43°77	'13	41°03	6°36	265°98	1°43
23	24°25'8	23°4'30	1°34'1	43°95	'12	41°20	6°03	265°82	1°43
25	24°23'5	23°2'48	-1°34'1	44°12	0°11	41°36	5°70	265°64	-1°43
27	24°21'0	23°0'57	1°34'1	44°29	'10	41°51	5°35	265°44	1°43
29	24°18'4	22°8'56	1°34'1	44°44	'08	41°65	4°99	265°21	1°43
31	24°15'6	22°6'46	1°34'0	44°59	'07	41°79	4°63	264°95	1°43
Feb. 2	24°12'7	22°4'29	1°33'8	44°72	'06	41°92	4°26	264°64	1°43
4	24°09'7	22°2'04	-1°33'6	44°84	0°05	42°03	3°88	264°27	-1°43
6	24°06'5	21°9'72	1°33'3	44°95	'04	42°14	3°50	263°82	1°42
8	24°03'2	21°7'33	1°32'9	45°06	'03	42°23	3°11	263°25	1°42
10	23°99'8	21°4'89	1°32'5	45°15	'03	42°31	2°71	262°54	1°41
12	23°96'2	21°2'40	1°32'1	45°22	'02	42°39	2°31	261°52	1°41
14	23°92'5	20°9'87	-1°31'6	45°29	0°01	42°45	1°91	260°1	-1°40
16	23°88'7	20°7'31	1°31'0	45°34	'01	42°50	1°50	258°0	1°40
18	23°84'9	20°4'72	1°30'4	45°38	'00	42°53	1°10	254°2	1°39
20	23°81'0	20°2'11	1°29'8	45°41	...	42°56	0°70	246°1	1°39
22	23°77'0	19°9'49	1°29'1	45°42	...	42°57	0°35	220°1	1°38

Greenwich Noon.	Bright- ness in Star Magn.	Longitude of $\mathcal{M}$'s Central Meridian. (877° 90) (870° 27)		Corr. for Phase.	Light- time.	$\Delta - 0$	$B.$
	m	I.	II.	°	m	°	°
1896. Dec. 12	-1.73	100.02	242.06	.47	42.458	14.1672	.7545
14	-1.74	55.90	282.68	.46	42.200	14.3221	.7626
16	-1.75	11.79	223.31	+0.45	41.944	14.4769	-0.7706
18	-1.77	327.70	163.96	.44	41.691	14.6317	.7787
20	-1.78	283.62	104.61	.43	41.440	14.7865	.7867
22	-1.79	239.54	45.27	.42	41.192	14.9413	.7947
24	-1.81	195.47	345.95	.41	40.947	15.0960	.8027
26	-1.82	151.42	286.64	+0.39	40.706	15.2507	-0.8107
28	-1.83	107.38	227.34	.38	40.469	15.4054	.8187
30	-1.84	63.35	168.04	.37	40.236	15.5600	.8267
1897. Jan. 1	-1.86	19.33	108.76	.35	40.007	15.7146	.8347
3	-1.87	335.31	49.49	.33	39.784	15.8692	.8427
5	-1.88	291.31	350.22	+0.32	39.566	16.0238	-0.8506
7	-1.89	247.32	290.97	.30	39.354	16.1783	.8586
9	-1.90	203.34	231.73	.28	39.148	16.3328	.8665
11	-1.92	159.36	172.49	.27	38.948	16.4873	.8745
13	-1.93	115.40	113.26	.25	38.754	16.6418	.8824
15	-1.94	71.44	54.04	+0.23	38.568	16.7962	-0.8903
17	-1.95	27.49	354.83	.21	38.389	16.9506	.8982
19	-1.96	343.54	295.62	.19	38.217	17.1050	.9061
21	-1.97	299.60	236.42	.18	38.053	17.2594	.9140
23	-1.98	255.67	177.23	.16	37.897	17.4137	.9219
25	-1.98	211.74	118.04	+0.14	37.749	17.5680	-0.9298
27	-1.99	167.81	58.85	.12	37.610	17.7223	.9377
29	-2.00	123.89	359.67	.11	37.480	17.8765	.9456
31	-2.01	79.98	300.49	.09	37.358	18.0307	.9535
Feb. 2	-2.01	36.06	241.32	.08	37.246	18.1849	.9613
4	-2.02	352.15	182.15	+0.07	37.144	18.3391	-0.9691
6	-2.03	308.24	122.98	.05	37.051	18.4932	.9770
8	-2.03	264.33	63.81	.04	36.968	18.6473	.9848
10	-2.04	220.42	4.63	.03	36.895	18.8014	.9926
12	-2.04	176.51	305.46	.02	36.833	18.9555	1.0004
14	-2.04	132.59	246.28	.02	36.780	19.1096	-1.0082
16	-2.04	88.67	187.10	+0.01	36.738	19.2636	1.0160
18	-2.05	44.75	127.92	.00	36.706	19.4176	1.0238
20	-2.05	0.82	68.74	..	36.684	19.5716	1.0316
22	-2.05	316.89	9.55	...	36.673	19.7255	1.0393

Greenwich Noon.	P.	L—O.	B.	Apparent Diameter.			<i>d.</i>	<i>w.</i>	B'.
				Equat. 2a	Defect.	Polar. 2b			
1897.									
Feb. 24	23° 729	19° 686	— 1° 284	45° 42	"...	42° 57	0° 32	142° 8	— 1° 37
26	23° 688	19° 423	1° 276	45° 41	...	42° 56	0° 65	111° 2	1° 36
28	23° 646	19° 161	1° 268	45° 38	'00	42° 54	1° 04	102° 2	1° 35
Mar. 2	23° 605	18° 902	1° 260	45° 34	'01	42° 50	1° 45	97° 0	1° 34
4	23° 563	18° 646	1° 251	45° 29	'01	42° 45	1° 86	95° 7	1° 33
6	23° 522	18° 393	— 1° 242	45° 23	0° 02	42° 39	2° 26	94° 1	— 1° 32
8	23° 480	18° 143	1° 233	45° 16	'02	42° 32	2° 66	93° 17	1° 31
10	23° 439	17° 898	1° 224	45° 07	'03	42° 24	3° 06	92° 39	1° 30
12	23° 398	17° 659	1° 214	44° 97	'04	42° 15	3° 45	91° 83	1° 29
14	23° 358	17° 426	1° 204	44° 86	'05	42° 05	3° 84	91° 36	1° 28
16	23° 319	17° 200	— 1° 195	44° 74	0° 06	41° 93	4° 22	90° 98	— 1° 27
18	23° 281	16° 981	1° 185	44° 61	'07	41° 81	4° 59	90° 67	1° 26
20	23° 244	16° 771	1° 175	44° 47	'08	41° 68	4° 95	90° 40	1° 25
22	23° 208	16° 568	1° 165	44° 32	'09	41° 54	5° 31	90° 16	1° 24
24	23° 173	16° 374	1° 156	44° 16	'11	41° 39	5° 66	89° 95	1° 23
26	23° 139	16° 190	— 1° 147	43° 99	0° 12	41° 23	5° 99	89° 77	— 1° 22
28	23° 107	16° 015	1° 137	43° 81	'13	41° 06	6° 32	89° 61	1° 21
30	23° 077	15° 851	1° 127	43° 62	'15	40° 89	6° 64	89° 46	1° 20
Apr. 1	23° 049	15° 697	1° 118	43° 43	'16	40° 71	6° 95	89° 33	1° 19
3	23° 022	15° 554	1° 109	43° 23	'17	40° 52	7° 24	89° 21	1° 18
5	22° 997	15° 422	— 1° 100	43° 03	0° 19	40° 33	7° 53	89° 10	— 1° 17
7	22° 974	15° 302	1° 091	42° 82	'20	40° 13	7° 80	89° 00	1° 16
9	22° 954	15° 193	1° 083	42° 60	'21	39° 93	8° 06	88° 91	1° 15
11	22° 936	15° 097	1° 075	42° 38	'22	39° 73	8° 31	88° 82	1° 15
13	22° 919	15° 013	1° 067	42° 16	'23	39° 52	8° 55	88° 74	1° 14
15	22° 905	14° 941	— 1° 059	41° 93	0° 24	39° 30	8° 78	88° 66	— 1° 13
17	22° 893	14° 881	1° 052	41° 70	'26	39° 09	8° 99	88° 59	1° 12
19	22° 883	14° 832	1° 045	41° 47	'27	38° 87	9° 19	88° 52	1° 12
21	22° 876	14° 796	1° 038	41° 24	'28	38° 65	9° 38	88° 46	1° 11
23	22° 871	14° 773	1° 032	41° 00	'28	38° 43	9° 56	88° 39	1° 10
25	22° 868	14° 761	— 1° 026	40° 76	0° 29	38° 20	9° 72	88° 33	— 1° 10
27	22° 868	14° 762	1° 021	40° 52	'30	37° 98	9° 88	88° 27	1° 09
29	22° 870	14° 776	1° 016	40° 28	'31	37° 76	10° 02	88° 22	1° 08
May 1	22° 875	14° 802	1° 012	40° 04	'31	37° 53	10° 15	88° 17	1° 08
3	22° 882	14° 840	1° 008	39° 80	'32	37° 31	10° 26	88° 12	1° 07
5	22° 891	14° 890	— 1° 004	39° 56	0° 32	37° 08	10° 36	88° 07	— 1° 07
7	22° 902	14° 952	1° 001	39° 33	'33	36° 86	10° 45	88° 02	1° 07
9	22° 915	15° 026	0° 998	39° 09	'33	36° 64	10° 53	87° 98	1° 06

Greenwich Noon.	Bright- ness in Star Magn.	Longitude of Υ 's Central Meridian.		Corr. for Phase.	Light- time.	A-O.	B.
		(877° 90') I.	(870° 27') II.				
1897.							
Feb. 24	-2°05	272°96	310°35	...	36°672	19°8794	-1°0470
26	-2°05	229°01	251°15	...	36°682	20°0333	1°0548
28	-2°05	185°06	191°94	'00	36°702	20°1872	1°0625
Mar. 2	-2°04	141°10	132°72	-0°01	36°733	20°3410	1°0702
4	-2°04	97°14	73°49	'01	36°774	20°4948	1°0779
6	-2°04	53°16	14°25	'02	36°825	20°6486	-1°0856
8	-2°03	9°17	315°00	'03	36°887	20°8024	1°0933
10	-2°03	325°17	255°74	'04	36°958	20°9561	1°1010
12	-2°02	281°16	196°48	'05	37°039	21°1098	1°1087
14	-2°02	237°14	137°20	'06	37°130	21°2635	1°1164
16	-2°01	193°10	77°90	-0°08	37°231	21°4172	-1°1241
18	-2°01	149°05	18°59	'09	37°341	21°5708	1°1318
20	-2°00	104°99	319°27	'11	37°459	21°7244	1°1394
22	-1°99	60°92	259°94	'12	37°587	21°8780	1°1471
24	-1°98	16°83	200°59	'14	37°723	22°0316	1°1547
26	-1°97	332°73	141°22	-0°16	37°868	22°1852	-1°1623
28	-1°96	288°61	81°85	'17	38°021	22°3387	1°1699
30	-1°95	244°47	22°46	'19	38°182	22°4922	1°1775
Apr. 1	-1°94	200°32	323°05	'21	38°351	22°6457	1°1851
3	-1°93	156°16	263°62	'23	38°527	22°7992	1°1927
5	-1°92	111°98	204°18	-0°25	38°710	22°9527	-1°2003
7	-1°91	67°78	144°73	'27	38°900	23°1061	1°2079
9	-1°90	23°57	85°26	'28	39°096	23°2595	1°2155
11	-1°89	339°34	25°77	'30	39°299	23°4129	1°2230
13	-1°88	295°10	326°27	'32	39°507	23°5663	1°2305
15	-1°86	250°84	266°75	-0°34	39°721	23°7196	-1°2380
17	-1°85	206°57	207°22	'35	39°940	23°8729	1°2455
19	-1°84	162°28	147°67	'37	40°164	24°0262	1°2530
21	-1°83	117°98	88°11	'38	40°393	24°1795	1°2605
23	-1°81	73°66	28°53	'40	40°626	24°3327	1°2680
25	-1°80	29°33	328°94	-0°41	40°864	24°4859	-1°2755
27	-1°79	344°98	269°33	'42	41°105	24°6391	1°2830
29	-1°77	300°62	209°71	'44	41°349	24°7923	1°2905
May 1	-1°76	256°24	150°08	'45	41°597	24°9455	1°2979
3	-1°75	211°85	90°43	'46	41°847	25°0986	1°3053
5	-1°73	167°45	30°77	-0°47	42°100	25°2517	-1°3127
7	-1°72	123°03	331°09	'48	42°355	25°4048	1°3201
9	-1°71	78°60	271°4	'48	42°612	25°5579	1°3275

Greenwich Noon.	P.	L-O.	B.	Apparent Diameter.			<i>d.</i>	<i>w.</i>	B'.
				Equat. 2a	Defect. 2b	Polar. 2b			
1897.									
May 11	22° 93' 1	15° 11' 1	0° 99' 6	38' 85	" 33	36" 42	10° 60	87° 93	1° 06
13	22° 949	15° 208	0° 994	38' 62	' 33	36' 20	10° 66	87° 89	1° 06
15	22° 969	15° 317	- 0° 992	38' 39	0' 33	35' 98	10° 70	87° 85	- 1° 06
17	22° 991	15° 437	0° 991	38' 16	' 33	35' 76	10° 74	87° 80	1° 06
19	23° 015	15° 568	0° 991	37' 93	' 33	35' 55	10° 76	87° 76	1° 06
21	23° 041	15° 709	0° 991	37' 70	' 33	35' 34	10° 77	87° 72	1° 06
23	23° 068	15° 860	0° 991	37' 48	' 33	35' 13	10° 77	87° 69	1° 06
25	23° 097	16° 022	- 0° 992	37' 26	0' 33	34' 92	10° 76	87° 65	- 1° 06
27	23° 128	16° 195	0° 993	37' 04	' 32	34' 72	10° 74	87° 61	1° 06
29	23° 160	16° 378	0° 995	36' 83	' 32	34' 52	10° 71	87° 57	1° 06
31	23° 194	16° 570	0° 997	36' 62	' 32	34' 32	10° 67	87° 53	1° 06
June 2	23° 230	16° 772	0° 999	36' 41	' 31	34' 12	10° 63	87° 49	1° 07
4	23° 267	16° 983	- 1° 002	36' 20	0' 31	33' 93	10° 57	87° 46	- 1° 07
6	23° 305	17° 204	1° 006	36' 00	' 30	33' 74	10° 50	87° 42	1° 07
8	23° 344	17° 434	1° 010	35' 81	' 30	33' 56	10° 42	87° 38	1° 08
10	23° 384	17° 672	1° 014	35' 61	' 29	33' 38	10° 33	87° 34	1° 08
12	23° 426	17° 918	1° 019	35' 42	' 28	33' 20	10° 24	87° 31	1° 09
14	23° 469	18° 173	- 1° 024	35' 24	0' 28	33' 03	10° 14	87° 27	- 1° 09
16	23° 513	18° 436	1° 030	35' 06	' 27	32' 86	10° 03	87° 23	1° 10
18	23° 557	18° 707	1° 036	34' 88	' 26	32' 69	9° 91	87° 19	1° 11
20	23° 601	18° 985	1° 042	34' 70	' 25	32' 53	9° 79	87° 15	1° 11
22	23° 646	19° 271	1° 049	34' 53	' 24	32' 37	9° 65	87° 11	1° 12
24	23° 693	19° 564	- 1° 056	34' 37	0' 24	32' 21	9° 51	87° 07	- 1° 13
26	23° 740	19° 864	1° 063	34' 21	' 23	32' 06	9° 36	87° 03	1° 13
28	23° 787	20° 171	1° 071	34' 05	' 22	31' 91	9° 21	86° 99	1° 14
30	23° 834	20° 485	1° 079	33' 89	' 21	31' 77	9° 05	86° 95	1° 15
July 2	23° 882	20° 806	1° 088	33' 74	' 20	31' 63	8° 88	86° 91	1° 16
4	23° 930	21° 132	- 1° 097	33' 60	0' 19	31' 49	8° 71	86° 86	- 1° 17
6	23° 978	21° 464	1° 106	33' 46	' 18	31' 36	8° 53	86° 81	1° 18
8	24° 027	21° 802	1° 116	33' 32	' 18	31' 23	8° 34	86° 76	1° 19
10	24° 075	22° 146	1° 126	33' 19	' 17	31' 10	8° 15	86° 71	1° 20
12	24° 123	22° 496	1° 136	33' 06	' 16	30' 98	7° 95	86° 66	1° 21
14	24° 170	22° 850	- 1° 147	32' 93	0' 15	30' 87	7° 75	86° 60	- 1° 22

Greenwich Noon.	Bright- ness in Star Magn.	Longitude of M's Central Meridian.		Corr. for Phase.	Light- time.	$\Delta - O.$	B.
		I.	II.				
1897.	^m				^m		
May 11	-1.69	34.15	211.70	.49	42.871	25.7109	1.3349
13	-1.68	349.70	151.99	.49	43.131	25.8639	1.3423
15	-1.67	305.23	92.26	-0.50	43.392	26.0169	-1.3496
17	-1.65	260.75	32.52	.50	43.654	26.1699	1.3570
19	-1.64	216.26	332.77	.50	43.916	26.3229	1.3644
21	-1.63	171.76	273.01	.50	44.179	26.4758	1.3717
23	-1.61	127.24	213.24	.50	44.442	26.6287	1.3790
25	-1.60	82.72	153.46	-0.50	44.705	26.7816	-1.3863
27	-1.59	38.19	93.67	.50	44.967	26.9345	1.3939
29	-1.58	353.65	33.87	.50	45.229	27.0874	1.4009
31	-1.56	309.10	334.06	.50	45.490	27.2403	1.4082
June 2	-1.55	264.54	274.24	.49	45.749	27.3931	1.4155
4	-1.54	219.97	214.41	-0.49	46.007	27.5459	-1.4227
6	-1.53	175.39	154.57	.48	46.264	27.6987	1.4300
8	-1.51	130.81	94.73	.47	46.519	27.8515	1.4372
10	-1.50	86.22	34.88	.46	46.771	28.0042	1.4444
12	-1.49	41.62	335.02	.46	47.022	28.1570	1.4516
14	-1.48	357.01	275.16	-0.45	47.270	28.3097	-1.4588
16	-1.47	312.40	215.29	.44	47.515	28.4624	1.4660
18	-1.46	267.78	155.41	.43	47.757	28.6151	1.4732
20	-1.45	223.15	95.53	.42	47.997	28.7678	1.4804
22	-1.44	178.52	35.64	.41	48.233	28.9204	1.4876
24	-1.43	133.89	335.75	-0.39	48.467	29.0730	-1.4947
26	-1.42	89.25	275.85	.38	48.696	29.2256	1.5019
28	-1.41	44.60	215.94	.37	48.922	29.3782	1.5090
30	-1.40	359.95	156.03	.36	49.144	29.5308	1.5161
July 2	-1.39	315.30	96.12	.34	49.362	29.6833	1.5232
4	-1.38	270.64	36.21	-0.33	49.576	29.8358	-1.5303
6	-1.37	225.98	336.29	.32	49.786	29.9883	1.5374
8	-1.36	181.32	276.37	.30	49.991	30.1408	1.5445
10	-1.35	136.65	216.44	.29	50.191	30.2933	1.5515
12	-1.34	91.98	156.51	.28	50.387	30.4457	1.5585
14	-1.33	47.31	96.58	-0.26	50.578	30.5981	-1.5655

P denotes the position-angle of *Jupiter's* axis ; $L - O + 180^\circ$ the jovicentric longitude of the Earth reckoned in the plane of the planet's equator from O, the point of the vernal equinox of *Jupiter's* northern hemisphere or of the descending node of the planet's equator on its orbit ; B the jovicentric latitude of the Earth above the equator.

The apparent equatorial and polar diameters of the disc depend on Professor Barnard's measurements adopted in the ephemeris for the preceding apparition, as they are required for the fifth satellite. It would be well if many of the first-rate instruments and micrometers available for the purpose were made to contribute to the investigation of the dimensions of the disc. The formulæ for finding the distances of the tangents to the limbs in right ascension and declination and in other directions, and also the defects of illumination, are published in vol. xl. p. 490 ff, and in vol. xlv. p. 408. To save trouble, the present ephemeris supplies again the values of d and w .

The brightness of *Jupiter*, expressed in star magnitudes, supposes $-2^m.233$ to be the brightness at mean opposition according to Professor G. Müller's determination.

The longitudes of *Jupiter's* central meridian are computed with unaltered values of the rates of rotation and of the zero-meridians in the two adopted systems. The addition of the "Corr. for Phase" gives the longitudes of the meridians, which bisect the illuminated disc. The following is a list of Greenwich mean times, when the adopted zero-meridians in the two systems will pass the middle of the illuminated disc :—

		I.				II.				I.		II.	
		(877°·90)				(870°·27)				(877°·90)		(870°·27)	
		h	m	h	m			h	m	h	m	h	m
1896.						1896.							
Oct.	6	20	39·5	19	55·3			22	25·0	24	0·6		
	7	16	20·7	15	46·8	Oct.	18	18	6·2	19	52·1		
	8	12	1·8	11	38·3		19	13	47·3	15	43·6		
		21	52·4	21	34·1		20	9	28·4	11	35·1		
	9	17	33·6	17	25·6			19	19·0	21	30·8		
	10	13	14·7	13	17·1		21	15	0·1	17	22·3		
		23	5·3	23	12·8		22	10	41·2	13	13·8		
	11	18	46·5	19	4·4			20	31·8	23	9·5		
	12	14	27·6	14	55·9		23	16	12·9	19	1·0		
	13	0	18·2	0	51·6		24	11	37	24's centre	72''·3		
		19	59·3	20	43·1					north of	* 9 ^m ·0.		
	14	15	40·5	16	34·6			11	54·1	14	52·5		
	15	11	21·6	12	26·1			21	44·6	24	48·2		
		21	12·2	22	21·9		25	17	25·7	20	39·7		
	16	16	53·3	18	13·4		26	13	6·8	16	21·2		
	17	12	34·5	14	4·9		27	18	38·5	22	18·4		

I. (877°·90)				II. (870°·27)				I. (877°·90)				II. (870°·27)			
1896.	h	m		h	m			1896.	h	m		h	m		
Oct.	28	14	19·6	18	9·8			Nov.	27	22	38·6	22	56·3		
	29	10	0·7	14	1·3				28	18	19·6	18	47·6		
		19	51·2	23	57·0				29	14	0·6	14	39·0		
	30	15	32·3	19	48·5					23	51·1	24	34·6		
	31	11	13·4	15	39·9				30	19	32·1	20	26·0		
Nov.	1	16	45·1	21	27·1			Dec.	1	15	13·0	16	17·4		
	2	12	26·2	17	18·5				2	10	54·0	12	8·7		
	3	17	57·8	13	10·0					20	44·5	22	4·4		
	4	13	38·9	18	57·1				3	16	25·5	17	55·7		
	5	9	20·0	14	48·6				4	12	6·5	13	47·1		
		19	10·5	24	44·3					21	57·0	23	42·7		
	6	14	51·6	20	35·7				5	17	38·0	19	34·0		
	7	10	32·6	16	27·1				6	13	18·9	15	25·4		
	8	16	4·2	12	18·6				7	8	59·9	11	16·7		
	9	11	45·3	18	5·7					18	50·4	21	12·3		
	10	17	16·9	13	57·1				8	14	31·3	17	3·7		
	11	12	58·0	19	44·2				9	10	12·3	12	55·0		
	12	18	29·5	15	35·6					20	2·8	22	50·6		
	13	14	0·6	21	22·7				10	15	43·7	18	41·9		
	14	19	42·2	17	14·2				11	11	24·7	14	33·3		
	15	15	23·2	13	5·6					21	15·2	24	28·9		
	16	11	4·2	18	52·7				12	7	5·7	10	24·6		
	17	16	35·8	14	44·1					16	56·1	20	20·2		
	18	12	16·8	10	35·5				13	12	37·1	16	11·5		
		22	7·4	20	31·1				14	8	18·0	12	2·8		
	19	17	48·4	16	22·5					18	8·5	21	58·5		
	20	13	29·4	12	13·9				15	13	49·4	17	49·8		
		23	20·0	22	9·6				16	9	30·4	13	41·1		
	21	19	1·0	18	1·0					19	20·9	23	36·7		
	22	14	42·0	13	52·4				17	15	1·8	19	28·0		
		24	32·5	23	48·1				18	10	42·7	15	19·3		
	23	10	23·0	9	43·8				19	6	23·7	11	10·6		
		20	13·5	19	39·4					16	14·1	21	6·2		
	24	15	54·5	15	30·8				20	11	55·0	16	57·5		
	25	11	35·6	11	22·2				21	7	36·0	12	48·8		
		21	26·1	21	17·9					17	26·4	22	44·4		
	26	17	7·1	17	9·2				22	13	7·3	8	40·0		
	27	12	48·1	13	0·6					22	57·8	18	35·7		

		I.		II.				I.		II.		
		(877°·90)		(870°·27)				(877°·90)		(870°·27)		
1896.		^h	^m	^h	^m	1897.		^h	^m	^h	^m	
Dec.	23	8	48·3	14	26·9	Jan.	14	12	12·0	12	34·6	
		18	38·7	24	22·6			22	2·5	22	30·2	
	24	14	19·6	10	18·2		15	7	52·9	8	25·8	
		24	10·1	20	13·8			17	43·3	18	41·4	
	25	10	0·6	16	5·1		16	13	24·2	14	12·6	
	26	15	31·9	11	56·3		17	9	5·0	10	3·8	
	27	11	12·8	17	43·2			18	55·4	19	59·4	
	28	16	44·1	13	34·5		18	14	36·3	15	50·6	
	29	12	25·0	9	25·7		19	10	17·1	11	41·8	
		22	15·5	19	41·4			20	7·5	21	37·4	
	30	17	56·4	15	12·6		20	5	57·9	7	33·0	
	31	13	37·3	11	3·9			15	48·4	17	28·6	
		23	27·7	20	59·5		21	11	29·2	13	19·8	
1897.								21	19·6	23	15·4	
Jan.	1	9	18·2	6	55·1			22	7	10·0	9	10·9
		19	8·6	16	50·7			17	0·4	19	6·5	
	2	14	49·5	12	42·0			23	12	41·3	14	57·7
		24	39·9	22	37·6		23	12	41·3	14	57·7	
	3	10	30·4	8	33·2		24	8	22·1	10	48·9	
		20	20·8	18	28·8			18	12·5	20	44·5	
	4	6	11·3	14	20·0		25	4	2·9	6	40·1	
		16	1·7	24	15·6			13	53·3	16	35·7	
	5	11	42·6	10	11·3		26	9	34·2	12	26·8	
		21	33·0	20	6·9			19	24·6	22	22·4	
	6	7	23·4	6	2·5		27	5	15·0	8	18·0	
		17	13·9	15	58·1			15	5·4	18	13·6	
	7	12	54·7	11	49·3		28	10	46·2	4	9·2	
		22	45·2	21	44·9			20	36·6	14	4·8	
	8	8	35·6	7	40·5		29	6	27·0	9	56·0	
		18	26·0	17	36·1			16	17·5	19	51·6	
	9	14	6·9	13	27·4		30	11	58·3	5	47·1	
		23	57·3	23	23·0			21	48·7	15	42·7	
	10	9	47·8	9	18·6		31	7	39·1	11	33·9	
		19	38·2	19	14·2			17	29·5	21	29·5	
	11	15	19·0	15	5·4	Feb.	1	13	10·3	7	25·0	
		10	59·9	10	56·6			23	0·7	17	20·6	
		20	50·3	20	52·2		2	8	51·1	13	11·8	
	13	6	40·8	6	47·8			18	41·5	23	7·4	
		16	31·2	16	43·4		3	4	32·0	9	3·0	

I. (877° 90)			II. (870° 27)			I. (877° 90)			II. (870° 27)		
1897. Feb.	h	m	1897. Feb.	h	m	1897. Feb.	h	m	1897. Feb.	h	m
3	14	22.4	18	58.5		21	15	20.3	13	48.6	
4	10	3.2	4	54.1		22	11	1.1	9	39.8	
	19	53.6	14	49.7			20	51.5	19	35.4	
5	5	44.0	10	40.9		23	6	41.9	5	31.0	
	15	34.4	20	36.5			16	32.3	15	26.6	
6	11	15.2	6	32.0		24	12	13.2	11	17.7	
	21	5.6	16	27.6			22	3.5	21	13.3	
7	6	56.0	12	18.8		25	7	54.0	7	8.9	
	16	46.4	22	14.4			17	44.4	17	4.5	
8	12	27.2	8	10.0		26	3	34.8	3	0.1	
	22	17.7	18	5.5			13	15.2	12	55.7	
9	8	8.1	4	1.1		27	9	6.1	8	46.9	
	17	58.5	13	56.7			18	56.5	18	42.5	
10	3	48.9	9	47.9		28	4	46.9	4	38.1	
	13	39.3	19	43.5			14	27.3	14	33.6	
11	9	20.1	5	39.0	Mar.	1	10	18.2	10	24.8	
	19	10.5	15	34.6			20	8.6	20	20.4	
12	5	0.9	11	25.8		2	5	59.0	6	16.0	
	14	51.3	21	21.4			15	49.4	16	11.6	
13	10	32.1	7	16.9		3	11	30.3	12	2.8	
	20	22.5	17	12.5			21	20.7	21	58.4	
	22	35.5	4' scentre 30'' 8			4	7	11.1	7	54.0	
			north of ★ 8 ^m .8.				17	1.6	17	49.6	
14	6	12.9	3	8.1		5	2	52.0	3	45.2	
	16	3.3	13	3.7			12	42.4	13	40.9	
15	11	44.1	8	54.8		6	8	23.3	9	32.1	
	21	34.6	18	50.4			18	13.7	19	27.7	
16	7	25.0	4	46.0		7	4	4.1	5	23.3	
	17	15.4	14	41.6			13	54.6	15	18.9	
17	3	5.8	10	32.8		8	9	35.4	11	10.1	
	12	56.2	20	28.4			19	25.9	21	5.7	
18	8	37.0	6	24.0		9	5	16.3	7	1.3	
	18	27.4	16	19.5			15	6.7	16	56.9	
19	4	17.8	2	15.1		10	10	47.3	12	48.2	
	14	8.2	12	10.7		11	6	28.5	8	39.4	
20	9	49.1	8	1.9			16	18.9	18	35.0	
	19	39.5	17	57.4		12	2	9.4	4	30.6	
21	5	29.9	3	53.0			11	59.8	14	26.2	

R R

		I.	II.			I.	II.
		(877° 0' 90")	(870° 0' 27")			(877° 0' 90")	(870° 0' 27")
		$\begin{smallmatrix} h & m \\ 1897. \end{smallmatrix}$	$\begin{smallmatrix} h & m \\ 1897. \end{smallmatrix}$			$\begin{smallmatrix} h & m \\ 1897. \end{smallmatrix}$	$\begin{smallmatrix} h & m \\ 1897. \end{smallmatrix}$
Mar.	13	7 40'7	10 17'5	Apr.	3	5 34'7	2 39'8
		17 31'3	20 13'1			15 25'2	12 35'5
	14	3 21'6	6 8'7		4	1 15'7	8 26'9
		13 12'1	16 4'3			11 6'2	18 22'5
	15	8 53'0	11 55'6		5	6 47'2	4 18'2
	16	4 33'9	7 46'9			16 37'7	14 13'9
		14 24'3	17 42'5		6	12 18'8	10 5'3
	17	10 5'2	3 38'1		7	7 59'8	5 56'6
		19 55'7	13 33'7			17 50'3	15 52'3
	18	5 46'1	9 25'0		8	13 31'3	11 43'7
		15 36'6	19 20'7		9	9 12'3	7 35'1
	19	1 27'1	5 16'3			19 2'8	17 30'8
		11 17'5	15 11'9		10	4 53'3	3 26'5
	20	6 58'4	11 3'2			14 43'9	13 22'1
	21	2 39'4	6 54'5		11	10 24'9	9 13'5
		12 29'8	16 50'1			20 15'4	19 9'2
	22	8 10'8	12 41'4		12	6 5'9	5 4'9
	23	3 51'7	8 32'7			15 56'5	15 0'6
		13 42'2	18 28'3		13	11 37'5	10 52'0
	24	9 23'1	4 24'0		14	7 18'6	6 43'5
		19 13'6	14 19'6			17 9'1	16 39'2
	25	5 4'0	10 10'9		15	12 50'1	12 30'6
		14 54'5	20 6'6		16	8 31'2	8 22'0
	26	10 35'5	6 2'2			18 21'7	18 17'7
		20 25'9	15 57'9		17	4 12'3	4 13'4
	27	6 16'4	11 49'2			14 2'8	14 9'1
	28	1 57'4	7 40'5		18	9 43'9	10 0'5
		11 47'9	17 36'2			19 34'4	19 56'3
	29	7 28'8	3 31'8		19	5 24'9	5 52'0
		17 19'3	13 27'5			15 15'5	15 47'7
	30	3 9'8	9 18'8		20	10 56'5	11 39'1
		13 0'3	19 14'4		21	6 37'6	7 30'5
	31	8 41'3	5 10'0			16 28'2	17 26'3
		18 31'8	15 5'7		22	2 18'7	3 22'0
Apr.	1	4 22'3	10 57'1			12 9'3	13 17'7
		14 12'7	20 52'8		23	7 50'4	9 9'2
	2	9 53'7	6 48'5			17 40'9	19 4'9
		19 44'2	16 44'2		24	3 31'5	5 0'6

I. (877°·90)				II. (870°·27)				I. (877°·90)				II. (870°·27)						
1897. Apr.	24	13	22·0	14	56·3	1897. May	18	18	6·0	14	50·1	19	13	47·2	10	41·7		
	25	9	3·1	10	47·8		19	13	47·2		10	41·7	20	9	28·4	6	33·3	
	26	4	44·2	6	39·3		20	9	28·4		6	33·3		19	19·0	16	29·0	
		14	34·8	16	35·0			19	19·0		16	29·0	21	15	0·3	12	20·6	
	27	10	15·9	12	26·5		21	15	0·3		12	20·6	22	10	41·5	8	12·1	
	28	5	57·0	8	17·9		22	10	41·5		8	12·1	23	6	22·7	4	3·7	
		15	47·6	13	13·7		23	6	22·7		4	3·7		16	23·3	13	59·5	
	29	11	28·7	14	5·1			16	23·3		13	59·5	24	11	54·5	9	51·1	
	30	7	9·8	9	56·6		24	11	54·5		9	51·1	25	7	35·7	5	42·6	
		17	0·4	19	52·4		25	7	35·7		5	42·6		17	26·3	15	38·4	
May	1	2	50·9	5	48·1			17	26·3		15	38·4	26	13	7·5	11	30·0	
		12	41·5	15	43·9		26	13	7·5		11	30·0	27	8	48·8	7	21·6	
	2	8	22·6	11	35·4		27	8	48·8		7	21·6		18	39·4	17	17·4	
	3	4	3·8	7	26·9			18	39·4		17	17·4	28	14	20·6	13	9·0	
		13	54·4	17	22·6		28	14	20·6		13	9·0	29	10	1·8	9	0·6	
	4	9	35·5	13	14·1		29	10	1·8		9	0·6	30	15	33·7	14	48·0	
	5	5	16·6	9	5·6		30	15	33·7		14	48·0	31	11	14·9	10	39·6	
		15	7·2	19	1·4		31	11	14·9		10	39·6	June	1	6	56·2	6	31·2
	6	10	48·4	14	52·9			6	56·2		6	31·2		16	46·8	16	27·0	
	7	6	29·5	10	44·4			16	46·8		16	27·0	2	12	28·1	12	18·6	
	8	2	10·7	6	35·9		2	12	28·1		12	18·6	3	8	9·3	8	10·2	
		12	1·3	16	31·7		3	8	9·3		8	10·2		17	59·9	18	6·0	
	9	7	42·4	12	23·2			17	59·9		18	6·0	4	3	50·5	4	1·8	
	10	3	23·6	8	14·7		4	3	50·5		4	1·8		9	5	2's centre	38''·6	
		13	14·2	18	10·5			9	5	south of ★ 8 ^m ·4.								
	11	8	55·4	4	6·2			13	41·2		13	57·6	5	9	22·4	9	49·2	
		18	45·9	14	2·0								6	14	54·3	15	36·6	
	12	4	36·5	9	53·5		5	9	22·4		9	49·2	7	10	35·5	11	28·2	
		14	27·1	19	49·3		6	14	54·3		15	36·6	8	6	16·8	7	19·8	
	13	10	8·3	5	45·1		7	10	35·5		11	28·2		16	7·4	17	15·6	
		19	58·9	15	40·8		8	6	16·8		7	19·8	9	11	48·7	13	7·2	
	14	15	40·1	11	32·4			16	7·4		17	15·6	10	7	29·9	8	58·8	
	15	1	30·7	7	23·9		9	11	48·7		13	7·2	11	13	1·8	14	46·3	
		11	21·3	17	19·7		10	7	29·9		8	58·8	12	8	43·1	10	37·9	
	16	7	2·4	13	11·2		11	13	1·8		14	46·3	13	4	24·4	6	29·5	
	17	2	43·6	9	2·8		12	8	43·1		10	37·9		14	15·0	16	25·3	
		12	34·2	18	58·5		13	4	24·4		6	29·5						
	18	8	15·4	4	54·3			14	15·0		16	25·3						
																	R R 2	

		I.		II.				I.		II.	
		(877°·90)		(870°·27)				(877°·90)		(870°·27)	
1897.		^h	^m	^h	^m	1897.		^h	^m	^h	^m
June	14	9	56·3	12	17·0	June	30	9	51·3	15	34·0
	15	5	37·5	8	8·6	July	1	5	32·6	11	25·6
	16	11	9·4	13	56·0		2	11	4·5	7	17·3
	17	6	50·7	9	47·7		3	6	45·8	13	4·8
	18	12	22·6	15	35·1		4	12	17·8	8	56·4
	19	8	3·9	11	26·8		5	7	59·1	14	43·9
	20	13	35·8	7	18·4		6	13	31·1	10	35·6
	21	9	17·1	13	5·9		7	9	12·4	6	27·3
	22	4	58·4	8	57·5		8	4	53·7	12	14·8
	23	10	30·3	14	45·0		9	10	25·6	8	6·4
	24	6	11·6	10	36·6		10	6	6·9	13	53·9
	25	11	43·6	6	28·2		11	11	38·9	9	45·6
	26	7	24·8	12	15·7		12	7	20·2	15	33·1
	27	12	56·8	8	7·4		13	12	52·1	11	24·7
	28	8	38·1	13	54·9		14	8	33·5	7	16·4
	29	4	19·4	9	46·5						

The intervals between successive passages of the zero-meridian vary in System I. between $9^h 50^m \cdot 40$ and $50^m \cdot 66$, and in II. between $9^h 55^m \cdot 58$ and $55^m \cdot 84$. The differences of successive values of the longitude of $\mathbf{2}$'s Central Meridian for the two days interval vary in System I. between $1755^\circ \cdot 33$ and $1756^\circ \cdot 09$, and in II. between $1740^\circ \cdot 07$ and $1740^\circ \cdot 83$.

Though System I. has, for some years past, ceased to represent the motion of any special spot, I continue to give it, so that it may be ready for being of use in the reduction of the observations of any equatorial spots. The rate of motion of the great reddish spot has been during eleven years so near the adopted $870^\circ \cdot 27$ of System II., that the longitude of the middle of the spot has remained within 10° of the adopted zero-meridian. The only observed passages across the middle meridian of the disc made during the planet's last apparition, which have yet reached me, are the following four, kindly communicated by Mr. Denning :

1895 Aug.	24	^h	^m	$\omega = 5^\circ 7'$	1895 Feb.	10	^h	^m	$\omega = 8^\circ 3'$
	Sept. 29	16	11	3·3		22	6	43	8·7

to which I can now add the first of the present apparition, which Mr. Denning has been on the alert to secure, 1896 September 27 $17^h 43^m \omega = 8^\circ \cdot 9$, so that the middle of the spot follows the zero-meridian about a quarter of an hour.

The observed passages of the second of the two dark spots observable during last season in *Jupiter's* northern hemisphere indicate that its daily rate of rotation has been very nearly $0^{\circ}20$ greater than that of the zero-meridian II., and that its longitude has been $270^{\circ}50-0^{\circ}20$ ($t-1896$ January 21.0). The residual differences between the longitudes ω corresponding to the observed times and the longitudes given by this formula are found in the following list, which contains all the observed passages which hitherto have come to my knowledge :

		G.M.T. h m	ω °	O-C. °	Observer.	References.
1895.						
Sept.	26	16 45	293.3	-0.1	Denning	Observatory, p. 327
Oct.	27	17 15	288.3	+0.7	MacEwen*	
Nov.	15	17 48	283.7	0.0	Brenner	Bull. Soc. Ast. Fr., p. 31
	23	14 20	280.6	-1.6	Lunt*	
1896.						
Jan.	15	12 48	275.4	+3.8	Lunt*	
	25	10 55.5	271.3	+1.7	Brenner	Journ. B. A. A., p. 214
	28	8 21	269.1	+0.1	Gledhill	Monthly Not., p. 483
		8 22	269.7	+0.7	MacEwen*	
	30	9 58	268.5	-0.1	Gledhill	
Feb.	2	7 22	265.4	-2.7	MacEwen*	
	4	9 2	266.6	-1.1	Denning	
	6	10 41	267.1	-0.1	Gledhill	
		10 46	270.2	+2.9	Brenner	
	9	8 6	264.5	-2.1	Gledhill	
		8 9.91	266.90	+0.27	Martin†	
		8 14	269.4	+2.7	Brenner	
	10	13 51.25	263.56	-2.02	Martin	
	11	9 40	262.1	-4.2	Gledhill	
		9 50.56	258.43	+2.21	Martin	
		9 51.5	269.0	+2.8	Brenner	
	13	11 23.48	265.30	-0.50	Martin	
	14	7 16	266.1	+0.4	Gledhill	
	16	9 5	267.0	+1.7	Antoniadi	Bull. Soc. Ast. Fr., p. 101
	18	0 35.4	265.3	+0.4	Merfield	Journ. B. A. A., p. 388
	20	12 7.24	264.07	-0.33	Rambaut†	
	21	7 57	263.1	-1.1	MacEwen*	
		7 57.76	263.47	-0.76	Rambaut	
		7 59	264.3	+0.1	Denning	

* Communicated by Mr. Waugh in advance of the Fifth Report of the *Jupiter* Section of the British Astronomical Association.

† "Scientific Proceedings of the Royal Dublin Society," vol. viii. p. 397.

		G.M.T. h m	ω	O-C.	Observer.	References.
1896.						
Feb.	23	9 35	263°0	-0°8	Gledhill	
		9 37·25	264°33	+0°51	Rambaut	
	24	5 30	265°2	+1°6	Gledhill	
	26	7 5·96	263°82	+0°58	Rambaut	
		7 6	263°8	+0°6	Gledhill	
Mar.	1	10 15	259°2	-3°2	"	
		10 20·30	262°41	0°00	Rambaut	
	4	7 48	261°2	-0°6	Gledhill	
	5	23 38·4	265°8	+4°3	Merfield	
	6	9 25	260°3	-1°1	Gledhill	
	8	1 15·4	265°0	+3°9	Merfield	
	8	11 5	261°3	+0°3	Gledhill	
	9	6 55	260°4	-0°4	"	
		6 55·98	261°02	+0°18	Rambaut	
		6 58	262°2	+1°4	MacEwen	
	11	8 33	260°1	-0°3	Brenner	
	15	21 50·4	263°0	+3°4	Merfield	
	16	7 39·61	259°03	-0°41	Rambaut	
		7 43	261°1	+1°6	Gledhill	
		7 44	261°7	+2°2	Brenner	Journ. B. A. A., p. 272
	18	9 18·5	259°2	+0°2	"	
		9 20	260°1	+1°1	Gledhill	
	22	12 56·78	259°87	+1°68	Hartwig	Astr. Nachr. 140, p. 167
	22	22 32·4	259°8	+1°7	Merfield	
	23	8 22	256°1	-1°9	Gledhill	
		8 24	257°3	-0°7	Brenner	
		8 25·4	258°1	+0°1	Lamp	Astr. Nachr. 140, p. 169
		8 27·6	259°5	+1°5	Villiger	" " p. 320
		8 27·70	259°54	+1°51	Hartwig	
	25	9 57	253°9	-3°7	Gledhill	
	26	5 57	259°1	+1°6	Brenner	
	28	7 30	255°6	-1°4	Gledhill	
	30	9 9	255°8	-0°9	"	
Apr.	4	8 19	256°4	+0°7	Brenner	
		9 7 23	253°2	-1°4	Gledhill	
	11	8 58	250°9	-3°3	"	
	16	8 6	250°1	-3°1	"	
	18	9 45·5	250°5	-2°3	"	
	20	11 29	253°2	+0°8	"	

1896.	G.M.T. h m	ω °	O-C.	Observer.	References.
Apr. 23	8 54	249°9	-1°9	Gledhill	
28	8 3	249°6	-1°2	„	
	8 11	254°4	+3°6	Brenner	Journ. B. A. A., p. 424
30	9 43	250°2	-0°2	Gledhill	
May 5	8 50.5	248°9	-0°5	„	
10	8 0	248°7	+0°3	„	
June 8	6 54	240°4	-2°3	Brenner	

In case this garnet spot has not meanwhile vanished and keeps moving at the daily rate of rotation $870^{\circ}.47$ (corresponding to the period $9^h 55^m 32^s.42$), it may be looked for

on Oct. 27 in long. $214^{\circ}.5$, or $4^h 1^m$ preceding the zero-meridian II.
 on Dec. 26 „ $202^{\circ}.5$ „ $4^h 21^m$ „ „ „ „

If, on *Jupiter's* spheroidal surface, ω is the (jovicentrically western) longitude of a spot or marking in the adopted system of longitudes, ω_0 that of the central meridian, and β' the latitude of the spot, the apparent co-ordinates x and y of the spot, referred to the semiaxes a and b , will be

$$x = a \sin (\omega - \omega_0) \cos \beta'$$

$$y = b \sin (\beta' - B') + x \tan \frac{1}{2} (\omega - \omega_0) \sin B$$

where $\tan B' = \tan B \sec \epsilon_0$ and $\tan \beta' = \tan \beta \sec \epsilon_0$, if β is the jovicentric latitude, which is, however, not wanted. Near the central meridian the second term of y is insignificant, so that β' is found by

$$\sin (\beta' - B') = \frac{y}{b},$$

and ω by

$$\sin (\omega - \omega_0) = \frac{x}{a} \sec \beta',$$

the defect of illumination being duly taken into account in measuring.

The star $9^m.0$, near which *Jupiter* passes on October 24, is W.B. $10^h.445$. On February 13 the star $8^m.8$, BD + $10^{\circ}.2181 =$ W.B. $10^h.580$, will be in conjunction with the

preceding border of the disc at ...	^h 21	^m 24	31°7 south
Centre „ „ ...	22	35.5	30°8 „
following limb „ ...	23	47	29°8 „

so that, if the unchecked place from W.B. can be depended on, the star will come within $10''$ of the southern limb of the disc. The star of June 4 is Ll. 20183 and also star *f* on p. 280 of *Astr. Nachr.* vol. liii. Its conjunction with the following border occurs at $7^h 59^m, 39''\cdot 2$ north, and with the preceding limb at $9^h 5^m, 38''\cdot 6$ north.

Data for Computing the Positions of the Satellites of Jupiter,
1896-97. By A. Marth.

The following data for computing the places of the satellites for the approaching apparition of *Jupiter* are a continuation of those for the preceding apparitions published in vols. li.-lv. of the *Monthly Notices*. They furnish, at intervals of ten days, the mean longitudes l of the satellites and the arguments of their inequalities. The motions of the longitudes and arguments during the intervals, and the inequalities corresponding to the arguments, are to be found on pp. 524-539 of vol. li.

The inclinations γ and the longitudes of the nodes Γ of the planes of the orbits referred to the plane of *Jupiter's* equator are the following :—

		Sat. I. γ_1 $O-\Gamma_1$		Sat. II. γ_2 $O-\Gamma_2$		Sat. III. γ_3 $O-\Gamma_3$		Sat. IV. γ_4 $O-\Gamma_4$	
1896.									
Sept.	17	0°0037	187°0	0°4807	180°63	0°1265	131°80	0°3378	29°44
Oct.	17	96	188°2	4804	181°60	1265	131°95	3379	29°49
Nov.	16	95	189°5	4802	182°57	1265	132°09	3380	29°54
Dec.	16	95	190°8	4799	183°54	1265	132°24	3381	29°58
1897.									
Jan.	15	94	192°1	4796	184°52	1265	132°38	3383	29°62
Feb.	14	0°0093	193°4	0°4794	185°49	0°1265	132°52	0°3385	29°66
Mar.	16	92	194°6	4791	186°47	1265	132°66	3387	29°69
Apr.	15	92	195°9	4788	187°44	1264	132°81	3388	29°72
May	15	91	197°1	4785	188°42	1264	132°95	3390	29°74
June	14	90	198°4	4782	189°40	1263	133°10	3392	29°76
July	14	0°0089	199°6	0°4780	190°38	0°1263	133°25	0°3394	29°77

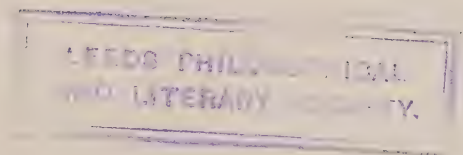
The rectangular co-ordinates of the satellites referred to the axes of the disc of *Jupiter* are found by means of the formulæ (v. vol. li. p. 506) :

$$\Delta' = \Delta + a\rho \cos B \cos (v-L)$$

$$x = \frac{a''}{\Delta'} \cdot \rho \sin (v-L)$$

$$y = \frac{a''}{\Delta'} \cdot \rho (\cos (v-L) \sin B + \sin \gamma \cos B \cdot \sin (v-\Gamma)).$$

The values of the distance Δ of *Jupiter* from the Earth and of L and B are to be interpolated for the times t , for which the positions are required, but those of l and of the arguments on which the true longitudes v and the rad. vect. ρ depend, for the times $t - \tau$, if τ is the light-time given in the ephemeris for physical observations. There are also found the jovicentric apparent longitudes $\Lambda - O + 180^\circ$, and latitudes B of the Sun referred to the planet's equator.



First Satellite.

Greenwich Noon.		Longitude.		Arguments.				
		$l_1 - 0$	S_1	α_1	β_1	γ_1	δ_1	ϵ_1
1896.		°	°					
Oct.	7	10°0399	—'0016	'8232	'956	'614	'421	'209
	17	244°9295	17	'4962	'374	'262	'073	'234
	27	119°8190	17	'1692	'792	'911	'725	'259
Nov.	6	354°7086	18	'8422	'211	'559	'377	'283
	16	229°5982	—'0019	'5152	'629	'207	'030	'308
	26	104°4877	19	'1882	'047	'856	'682	'333
Dec.	6	339°3773	20	'8612	'465	'504	'334	'357
	16	214°2668	21	'5342	'884	'152	'986	'382
	26	89°1564	22	'2073	'302	'801	'639	'407
1897.								
Jan.	5	324°0460	22	'8803	'720	'449	'291	'431
	15	198°9355	—'0023	'5533	'138	'097	'943	'456
	25	73°8251	24	'2263	'557	'745	'596	'481
Feb.	4	308°7146	25	'8993	'975	'393	'248	'505
	14	183°6042	25	'5723	'393	'042	'900	'530
	24	58°4938	26	'2453	'811	'690	'552	'555
Mar.	6	293°3833	27	'9183	'230	'339	'205	'580
	16	168°2729	—'0028	'5914	'648	'987	'857	'604
	26	43°1624	28	'2644	'066	'635	'509	'629
Apr.	5	278°0520	29	'9374	'484	'284	'161	'654
	15	152°9416	30	'6104	'903	'932	'814	'678
	25	27°8311	31	'2834	'321	'580	'466	'703
May	5	262°7207	31	'9564	'739	'229	'118	'728
	15	137°6102	—'0032	'6294	'157	'877	'771	'752
	25	12°4998	33	'3024	'576	'525	'423	'777
June	4	247°3894	34	'9755	'994	'174	'075	'802
	14	122°2789	34	'6485	'412	'822	'727	'826
	24	357°1685	35	'3215	'830	'470	'380	'851
July	4	232°0580	36	'9945	'249	'119	'032	'876
	14	106°9476	—'0037	'6675	'667	'767	'684	'900

Greenwich Noon. 1896.	First Satellite.			Second Satellite.			
	ζ_1	Arguments, η_1	θ_1	Longitude, $l_2 - 0$	S_2	Arguments, α_2	β_2
Oct. 7	·643	·903	·713	221° 87' 20	—·0078	·91158	·956
17	·665	·923	·734	155° 61' 92	77	·74808	·374
27	·687	·944	·755	89° 36' 65	77	·58459	·792
Nov. 6	·709	·965	·775	323° 11' 38	76	·42110	·211
16	·730	·986	·795	316° 86' 10	—·0075	·25760	·629
26	·752	·006	·816	250° 60' 83	75	·09411	·047
Dec. 6	·774	·027	·837	184° 35' 55	74	·93062	·465
16	·796	·048	·857	118° 10' 28	73	·76712	·884
26	·817	·069	·878	51° 85' 00	72	·60363	·302
1897. Jan. 5	·839	·089	·898	345° 59' 73	72	·44014	·720
15	·861	·110	·919	279° 34' 46	—·0071	·27664	·138
25	·883	·131	·940	213° 09' 18	70	·11315	·557
Feb. 4	·904	·152	·960	146° 83' 91	69	·94965	·975
14	·926	·172	·981	80° 58' 63	68	·78616	·393
24	·948	·193	·001	14° 33' 36	67	·62267	·811
Mar. 6	·970	·214	·022	308° 08' 08	67	·45917	·230
16	·991	·234	·043	241° 82' 81	—·0066	·29568	·648
26	·013	·255	·063	175° 57' 53	65	·13219	·066
Apr. 5	·035	·276	·084	109° 32' 26	64	·96869	·484
15	·057	·297	·104	43° 06' 99	63	·80520	·903
25	·078	·317	·125	336° 81' 71	62	·64171	·321
May 5	·100	·338	·146	270° 56' 44	61	·47821	·739
15	·122	·359	·166	204° 31' 16	—·0060	·31472	·157
25	·144	·380	·187	138° 05' 89	59	·15122	·576
June 4	·165	·400	·207	71° 80' 61	58	·98773	·994
14	·187	·421	·228	5° 55' 34	57	·82424	·412
24	·209	·442	·248	299° 30' 06	56	·66074	·830
July 4	·231	·463	·269	233° 04' 79	55	·49725	·249
14	·252	·483	·290	166° 79' 52	—·0054	·33376	·667

Second Satellite.

Greenwich Noon. 1896.	Arguments.								
	γ_2	δ_2	ϵ_2	ζ_2	η_2	θ_2	ι_2	κ_2	λ_2
Oct. 7	.268	.009	.199	.643	.403	.213	.709	.814	.625
17	.083	.825	.015	.665	.423	.234	.734	.671	.482
27	.898	.640	.830	.687	.444	.255	.759	.529	.339
Nov. 6	.712	.456	.646	.709	.465	.275	.783	.386	.196
16	.527	.272	.462	.730	.486	.295	.808	.243	.053
26	.342	.088	.278	.752	.506	.316	.833	.100	.910
Dec. 6	.157	.904	.094	.774	.527	.337	.857	.958	.767
16	.971	.719	.910	.796	.548	.357	.882	.815	.624
26	.786	.535	.926	.817	.569	.378	.907	.672	.481
1897. Jan. 5	.601	.351	.942	.839	.589	.398	.931	.529	.338
15	.416	.167	.358	.861	.610	.419	.956	.387	.196
25	.230	.982	.174	.883	.631	.440	.981	.244	.053
Feb. 4	.045	.798	.990	.904	.652	.460	.005	.101	.910
14	.860	.614	.805	.926	.672	.481	.030	.958	.767
24	.675	.430	.621	.948	.693	.501	.055	.816	.624
Mar. 6	.489	.245	.437	.970	.714	.522	.080	.673	.481
16	.304	.061	.253	.991	.734	.543	.104	.530	.338
26	.119	.877	.069	.013	.755	.563	.129	.387	.195
Apr. 5	.934	.693	.885	.035	.776	.584	.154	.245	.052
15	.748	.508	.701	.057	.797	.604	.178	.102	.910
25	.563	.324	.517	.078	.817	.625	.203	.959	.767
May 5	.378	.140	.333	.100	.838	.646	.228	.816	.624
15	.193	.956	.149	.122	.859	.666	.252	.674	.481
25	.008	.772	.965	.144	.880	.687	.277	.531	.338
June 4	.822	.587	.780	.165	.900	.707	.302	.389	.195
14	.637	.403	.596	.187	.921	.728	.326	.245	.052
24	.452	.219	.412	.209	.942	.748	.351	.103	.909
July 4	.267	.035	.228	.231	.963	.769	.376	.960	.766
14	.081	.850	.044	.252	.983	.790	.400	.817	.623

Third Satellite.

Greenwich Noon. 1896.	Longitude.			Arguments.		
	$\iota_1 - 0$	S_3	α_3	β_3	γ_3	δ_3
Oct. 7	57°7880	—°0091	°5532	°7428	°9558	°091
17	200°9641	90	°9507	°1405	°3740	°890
27	344°1402	89	°3482	°5381	°7923	°688
Nov. 6	127°3163	88	°7457	°9358	°2105	°486
16	270°4924	—°0087	°1432	°3334	°6288	°285
26	53°6685	85	°5407	°7311	°0471	°083
Dec. 6	196°8447	84	°9382	°1287	°4653	°882
16	340°0208	83	°3358	°5264	°8836	°680
26	123°1969	82	°7333	°9243	°3018	°479
1897. Jan. 5	266°3730	80	°1308	°3217	°7201	°277
15	49°5491	—°0079	°5283	°7194	°1383	°076
25	192°7252	78	°9258	°1170	°5565	°875
Feb. 4	335°9013	76	°3233	°5147	°9748	°673
14	119°0774	75	°7208	°9123	°3931	°472
24	262°2535	74	°1183	°3100	°8113	°270
Mar. 6	45°4296	72	°5158	°7077	°2296	°069
16	188°6057	—°0071	°9134	°1053	°6478	°867
26	331°7818	69	°3109	°5030	°0661	°666
Apr. 5	114°9579	68	°7084	°9006	°4843	°464
15	258°1340	66	°1059	°2983	°9026	°263
25	41°3101	65	°5034	°6959	°3209	°061
May 5	184°4862	64	°9009	°0936	°7391	°860
15	327°6623	—°0062	°2984	°4913	°1574	°658
25	110°8384	60	°6959	°8889	°5756	°457
June 4	254°0145	59	°0935	°2866	°9939	°255
14	37°1906	57	°4910	°6842	°4121	°054
24	180°3667	55	°8885	°0819	°8304	°852
July 4	323°5428	54	°2860	°4795	°2486	°651
14	106°7189	—°0053	°6835	°8772	°6669	°449

		Third Satellite.				Fourth Satellite.		
Greenwich Noon. 1896.		Arguments.				Longitude.		Arg.
		ζ_1	η_1	θ_1	ι_1	$\iota_1 - 0$	S_1	a_1
Oct.	7	'643	'903	'713	'312	205°0832	—'0295	'15196
	17	'665	'923	'734	'709	60°7939	'0292	'75110
	27	'687	'944	'755	'105	276°5047	'0289	'35025
Nov.	6	'709	'965	'775	'502	132°2154	'0286	'94939
	16	'730	'986	'795	'898	347°9261	—'0283	'54853
	26	'752	'006	'816	'295	203°6369	'0280	'14767
Dec.	6	'774	'027	'837	'691	59°3476	'0277	'74681
	16	'796	'048	'857	'088	275°0584	'0274	'34596
	26	'817	'069	'878	'484	130°7691	'0271	'94510
1897.								
Jan.	5	'839	'089	'898	'881	346°4798	'0267	'54424
	15	'861	'110	'919	'277	202°1906	—'0264	'14338
	25	'883	'131	'940	'674	57°9013	'0261	'74252
Feb.	4	'904	'152	'960	'070	273°6121	'0257	'34166
	14	'926	'172	'981	'467	129°3228	'0254	'94081
	24	'948	'193	'001	'863	345°0335	'0250	'53995
Mar.	6	'970	'214	'022	'260	200°7443	'0247	'13909
	16	'991	'234	'043	'656	56°4550	—'0243	'73823
	26	'013	'255	'063	'053	272°1658	'0240	'33737
Apr.	5	'035	'276	'084	'449	127°8765	'0236	'93652
	15	'057	'297	'104	'846	343°5872	'0232	'53566
	25	'078	'317	'125	'242	199°2980	'0229	'13480
May	5	'100	'338	'146	'639	55°0087	'0225	'73394
	15	'122	'359	'166	'035	270°7195	—'0221	'33308
	25	'144	'380	'187	'432	126°4302	'0217	'93223
June	4	'165	'400	'207	'828	342°1409	'0213	'53137
	14	'187	'421	'228	'225	197°8517	'0210	'13051
	24	'209	'442	'248	'621	53°5624	'0206	'72965
July	4	'231	'463	'269	'018	269°2732	'0202	'32879
	14	'252	'483	'290	'414	124°9839	—'0198	'92794

Fourth Satellite.

Greenwich Noon. 1896.		Arguments.						
		β_1	γ_1	δ_1	ϵ_1	ζ_1	η_1	θ_1
Oct.	7	·091	·462	·961	·113	·439	·047	·129
	17	·890	·061	·555	·306	·638	·263	·328
	27	·688	·660	·150	·500	·838	·480	·528
Nov.	6	·486	·259	·745	·694	·037	·697	·727
	16	·285	·858	·339	·888	·236	·914	·927
	26	·083	·457	·934	·082	·436	·130	·126
Dec.	6	·882	·056	·528	·275	·635	·347	·326
	16	·680	·655	·123	·469	·835	·564	·525
	26	·479	·254	·718	·663	·034	·781	·725
1897.								
Jan.	5	·277	·853	·312	·857	·233	·998	·924
	15	·076	·452	·907	·050	·433	·214	·124
	25	·875	·051	·502	·244	·632	·431	·323
Feb.	4	·673	·650	·096	·438	·831	·648	·523
	14	·472	·249	·691	·632	·031	·865	·722
	24	·270	·848	·286	·826	·230	·081	·922
Mar.	6	·069	·447	·880	·019	·429	·298	·121
	16	·867	·046	·475	·213	·629	·515	·321
	26	·666	·645	·069	·407	·828	·732	·520
Apr.	5	·464	·244	·664	·601	·028	·948	·720
	15	·263	·843	·259	·794	·227	·165	·919
	25	·061	·442	·853	·988	·426	·382	·119
May	5	·860	·041	·448	·182	·626	·599	·318
	15	·658	·640	·043	·376	·825	·816	·518
	25	·457	·239	·637	·569	·024	·032	·717
June	4	·255	·838	·234	·763	·224	·249	·917
	14	·054	·437	·827	·957	·423	·466	·116
	24	·852	·036	·421	·151	·623	·683	·316
July	4	·651	·635	·016	·345	·822	·899	·516
	14	·449	·234	·610	·538	·021	·116	·715

As no measurements of the fifth satellite made during the last season have yet come to my knowledge, I must content myself with going on with the adopted daily rate of motion $722^{\circ}633$, deduced from the measures of 1892 and 1893, so that its uncertainty will now appear trebled.

Ephemeris of the Fifth Satellite of Jupiter, 1896-97.

Greenwich Noon. 1896.	P+90°.	a_s	b_s	l_s-L	Greenwich Times of greatest Elongations.			
					h	m	h	m
Nov. 16	114°11'	45°34'	-0°80'	106°53'	17	23 W.	23	22 E.
18	114°14'	45°60'	°82	111°70'	17	13	23	12
20	114°17'	45°86'	°83	116°89'	17	3	23	1
22	114°20'	46°12'	°85	122°08'	16	52	22	51
24	114°22'	46°39'	°87	127°29'	16	42	22	40
26	114°25'	46°66'	-0°89'	132°51'	16	31 W.	22	30 E.
28	114°27'	46°94'	°90	137°74'	16	21	22	20
30	114°29'	47°22'	°92	142°98'	16	11	22	9
Dec. 2	114°31'	47°51'	°94	148°23'	16	0	21	59
4	114°33'	47°80'	°96	153°49'	15	50	21	48
6	114°34'	48°09'	-0°97'	158°76'	15	39 W.	21	38 E.
8	114°36'	48°38'	0°99	164°05'	15	28	21	27
10	114°37'	48°67'	1°01	169°34'	15	18	21	17
12	114°38'	48°97'	1°02	174°65'	15	7	21	6
14	114°39'	49°27'	1°04	179°97'	14	57	20	55
16	114°40'	49°57'	-1°05'	185°30'	14	46 W.	20	45 E.
18	114°41'	49°87'	1°07	190°65'	14	35	20	34
20	114°41'	50°18'	1°09	196°00'	14	25	20	23
22	114°42'	50°48'	1°10	201°37'	14	14	20	13
24	114°42'	50°78'	1°12	206°74'	14	3	20	2
26	114°42'	51°08'	-1°13'	212°13'	13	53 W.	19	51 E.
28	114°42'	51°38'	1°15	217°53'	13	42	19	41
30	114°41'	51°68'	1°16	222°94'	13	31	19	30
1897.								
Jan. 1	114°41'	51°97'	1°17	228°36'	13	20	19	19
3	114°40'	52°26'	1°19	233°79'	13	9	19	8
5	114°40'	52°55'	-1°20'	239°23'	12	59 W.	18	57 E.
7	114°39'	52°84'	1°21	244°68'	12	48	18	46
9	114°38'	53°12'	1°22	250°14'	12	37	18	35
11	114°37'	53°39'	1°23	255°61'	12	26	18	25
Jan. 13	114°35'	53°65'	1°24	261°09'	12	15	18	14
15	114°34'	53°91'	-1°25'	266°58'	12	4 W.	18	3 E.

Greenwich Noon. 1897.	P + 90°.	a_s	b_s	$l_s - L_s$	Greenwich Times of greatest Elongations.	
					h m	h m
Jan. 17	114°32	54'16	1'26	272°07	11 53	17 52
19	114°30	54'41	1'27	277°57	11 42	17 41
21	114°28	54'64	1'28	283°08	11 31	17 30
23	114°26	54'87	1'28	288°60	11 20	17 19
25	114°24	55°08	— 1'29	294°12	11 9 W.	17 8 E.
27	114°21	55°29	1'29	299°65	10 58	16 57
29	114°18	55°48	1'30	305°18	10 47	16 46
31	114°16	55°66	1'30	310°71	10 36	16 35
Feb. 2	114°13	55°83	1'30	316°25	10 25	16 24
4	114°10	55°98	1'30	321°80	10 14 W.	16 13 E.
	114°07	56°12	— 1'30	327°34	10 3	16 2
8	114°03	56°25	1'30	332°89	9 52	15 51
10	114°00	56°36	1'30	338°43	9 41	15 40
12	113°96	56°45	1'30	343°98	9 30	15 28
14	113°93	56°53	— 1'30	349°53	9 19 W.	15 17 E.
16	113°89	56°60	1'29	355°07	9 8	15 6
18	113°85	56°65	1'29	0 61	8 57	14 55
20	113°81	56°68	1'28	6°15	8 46	14 44
22	113°77	56°70	1'28	11°68	8 35	14 33
24	113°73	56°70	— 1'27	17°21	8 24 W.	14 22 E.
26	113°69	56°68	1'26	22°73	8 13	14 11
28	113°65	56°65	1'25	28°25	8 2	14 0
Mar. 2	113°61	56°60	1'24	33°76	7 51	13 49
4	113°56	56°54	1'23	39°26	7 40	13 38
6	113°52	56°46	— 1'22	44°75	7 29 W.	13 27 E.
8	113°48	56°37	1'21	50°24	7 18	13 16
10	113°44	56°26	1'20	55°72	7 7	13 6
12	113°40	56°14	1'19	61°18	6 56	12 55
14	113°36	56°00	1'18	66°63	6 45 W.	12 44 E.
16	113°32	55°85	— 1'16	72°08	12 33 E.	18 32 W.
18	113°28	55°69	1'15	77°51	12 22	18 21
20	113°24	55°56	1'14	82°92	12 11	18 10
22	113°21	55°32	1'13	88°33	12 1	17 59
24	113°17	55°12	1'11	93°72	11 50	17 49
26	113°14	54°91	— 1'10	99°10	11 39 E.	17 38 W.
28	113°11	54°69	1'08	104°46	11 29	17 27
30	113°08	54°46	1'07	109°81	11 18	17 17
Apr. 1	113°05	54°22	1'06	115°15	11 7	17 6

Greenwich Noon. 1897.	P+90°.	a_s	b_s	l_s-L	Greenwich Times of greatest Elongations.	
					h m	h m
Apr. 3	113°02	53°97	1°04	120°47	10 57	16 55
5	113°00	53°71	-1°03	125°77	10 46 E.	16 45 W.
7	112°97	53°45	1°02	131°06	10 36	16 34
9	112°95	53°18	1°00	136°34	10 25	16 24
11	112°94	52°91	0°99	141°60	10 15	16 13
13	112°92	52°63	0°98	146°84	10 4	16 3
15	112°90	52°35	-0°97	152°08	9 54 E.	15 52 W.
17	112°89	52°06	°96	157°29	9 43	15 42
19	112°88	51°77	°94	162°49	9 33	15 32
21	112°88	51°48	°93	167°68	9 23	15 21
23	112°87	51°18	°92	172°85	9 12	15 11
25	112°87	50°88	-0°91	178°01	9 2 E.	15 1 W.
27	112°87	50°59	°90	183°16	8 52	14 51
29	112°87	50°29	°89	188°29	8 42	14 40
May 1	112°88	49°99	°88	193°40	8 31	14 30
3	112°88	49°69	°87	198°50	8 21	14 20
5	112°89	49°39	-0°87	203°59	8 11 E.	14 10 W.
7	112°90	49°09	°86	208°67	8 1	14 0
9	112°91	48°79	85	213°73	7 51	13 50
11	112°93	48°50	°84	218°78	7 41	13 40
13	112°95	48°21	°84	223°82	7 31	13 30
15	112°97	47°92	-0°83	228°85	7 21 E.	13 20 W.

The differences between successive values of l_s-L for the interval of two days vary between $1445^{\circ}03$ and $1445^{\circ}55$. The values are to be interpolated for the times of the observations, when the corresponding computed co-ordinates will be :

$$x_s = a_s \sin (l_s - L) \text{ in pos. angle } P \pm 90^{\circ}$$

$$y_s = b_s \cos (l_s - L) \quad , \quad , \quad P.$$

It is most desirable that the x measurements should be made before and after the greatest elongations as far away as feasible.

Col. Cooper's Observatory:
Markree, Collooney, Ireland.

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